

ACTUAL SIZE



Collins Mechanical Filters

GENERAL CATALOG



COLLINS RADIO COMPANY

Western Division

Small Size

as small as 0.3 cubic inch

Reliability

proven in years of service by industry and military services

Economy

in simplified design and reduced maintenance

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Collins Mechanical Filters

Collins' Mechanical Filter offers equipment designers the greatest combination of selectivity, simplicity, compactness and reliability ever developed in a filter system

Packaged in cases as small as one-third cubic inch, Collins Mechanical Filters achieve a flat-topped frequency response characteristic; they have been built with a 60-to-6 db shape factor as low as 1.2 to 1. To the design engineer, this means an increase in performance and decrease in size, expense and maladjustment, and for these reasons the Filter has been widely accepted by industry and the Armed Forces.

Among the end products in which the wide variety of Filter styles are employed are high performance transmitting and receiving equipment, multiplexing equipment, missile guidance systems, frequency synthesizers, doppler radar, data transmission systems, precision navigation equipment and spectrum analyzers.

Many advances in frequency spectrum conservation have been made possible by the Filters and Resonators and their selectivity characteristics which approach theoretical limits. Such techniques are split channel reception, improved methods of amplitude modulation and single sideband, and data handling systems.

Although Mechanical Filters are relatively new, their design is based on well established principles. The Filter is a mechanically resonant device which receives electrical energy, converts it into mechanical vibration, then converts the mechanical vibration back into electrical energy at the output.

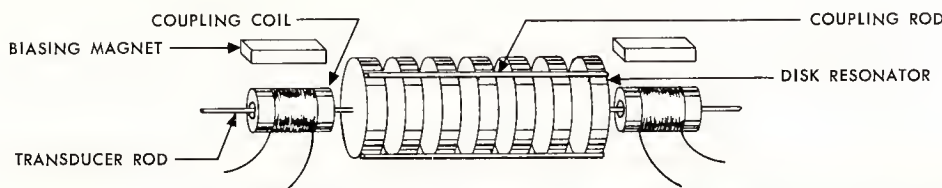
The Mechanical Filters consist of three basic elements: (1) transducers which convert electrical oscillations into mechanical oscillations or vice versa, (2) metal disks which are mechanically resonant, and (3) disk coupling rods.

The transducer, which converts electrical and mechanical energy, is a magnetostrictive device based on the principle

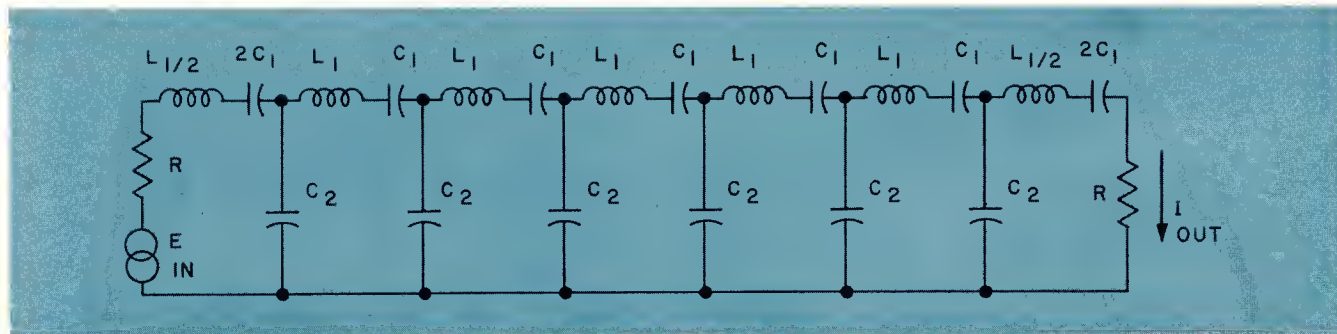
that certain materials elongate or shorten when in the presence of a magnetic field. Therefore, if an electrical signal is sent through a coil which contains the magnetostrictive material as the core, the electrical oscillation will be converted into a mechanical oscillation. The mechanical oscillation can then be used to drive the mechanical elements of the Filter. In addition to electrical and mechanical conversion, the transducer also provides proper termination for the mechanical network.

From the electrical equivalent circuit it is seen that the center frequency of the Mechanical Filter is determined by the metal disks, which are represented by a series resonant circuit, $L_1 C_1$. In practice, Filters with center frequencies between 60 kc and 600 kc are being manufactured. This by no means indicates limitations, but is merely the area of design concentration in a relatively new field. Since each disk represents a series resonant circuit, increasing the number of disks increases skirt selectivity of the Filter. Skirt selectivity is specified as shape factor, which is the ratio (bandwidth 60 db below peak)/(bandwidth 6 db below peak).

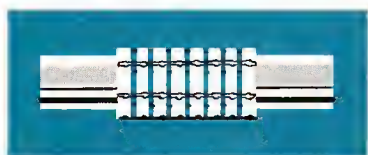
In the equivalent circuit, the coupling capacitors, C_2 , represent the rods which couple the disks. By varying the mechanical coupling between the disks, i.e. making the coupling rods larger or smaller, the bandwidth of the Filter is varied. Because the bandwidth varies approximately as the total area of the coupling wires, the bandwidth can be increased by either using larger or more coupling rods. Standard available bandwidths range from 500 cps to 35 kc, and special units have been built with bandwidths as narrow as 30 cps and as wide as 60 kc.



FUNCTIONAL DIAGRAM OF A TYPICAL MECHANICAL FILTER



ELECTRICAL ANALOG OF A MECHANICAL FILTER



SPECIFICATIONS FOR A TYPICAL MECHANICAL FILTER

Detailed specifications available for all Filter types on request

Filter Type: F455Z-4

Description: Upper sideband selector for 455 kc carrier frequency

FREQUENCY RESPONSE:

6 db Bandwidth	3.3 kc \pm 300 cps
60 db Bandwidth	6.0 kc max.
Peak-to-Valley Ratio	3 db max.
Terminal Impedance	27 K ohms
Transfer Impedance	8.5 K ohms \pm 45%
Resonating Capacity	130 uuf
Transmission Loss	10 db
Spurious Response	60 db min. atten.

ADDITIONAL SELECTIVITY DATA

Frequency kc	Attenuation db
454.60	40 min.
455.00	20 min.
455.30	6 max.
455.45	3 max.
458.15	3 max.
458.30	6 max.

This Mechanical Filter is used to select only the upper sideband of a 455 kc amplitude modulated carrier, rejecting the carrier by at least 20 db and the lower sideband by at least 40 db.

Application and Design Considerations

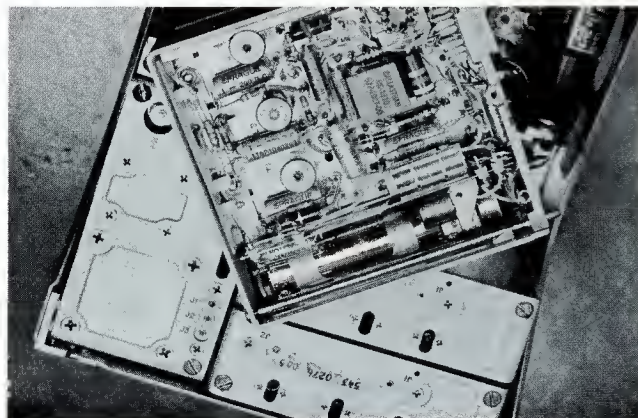
The design and construction of circuits employing Mechanical Filters is relatively simple, since no special matching networks are normally required. Being internally terminated, the Filters need only a high resistance termination of un-critical value at either end together with the specified resonating capacity.

This high resistance is readily obtained by driving the Filter with a pentode tube (effectively a constant current generator) and terminating it into a vacuum tube grid. It was this usage that led to the use of the term "transfer impedance" in specifying the effect of a Mechanical Filter on the gain of a given circuit. The transfer impedance is the ratio of the input current to the output voltage, so the over-all gain of an amplifier stage with a Mechanical Filter following

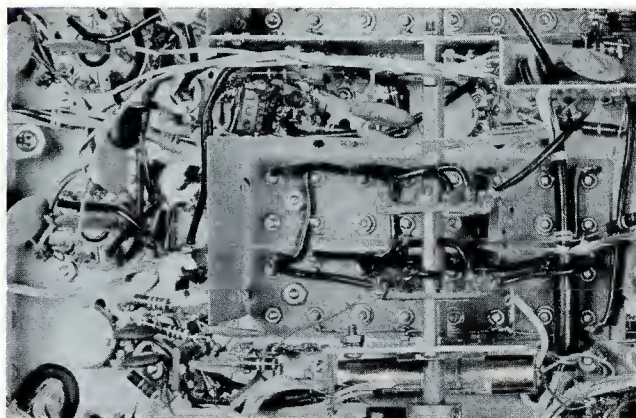
the amplifier tube is simply equal to the transconductance of the tube times the transfer impedance.

The small size and high performance characteristics of Mechanical Filters make them a natural choice when designing bandpass circuits using transistor amplifiers. The Filters can be readily matched into the low resistance circuits encountered with transistors by using a series resonant filter termination instead of the normal parallel resonant condition. The lowest value of impedance that can be matched is determined by the extent to which the stray capacity across the Filter can be minimized. This impedance will be in the order of magnitude normally encountered with grounded emitter amplifiers.

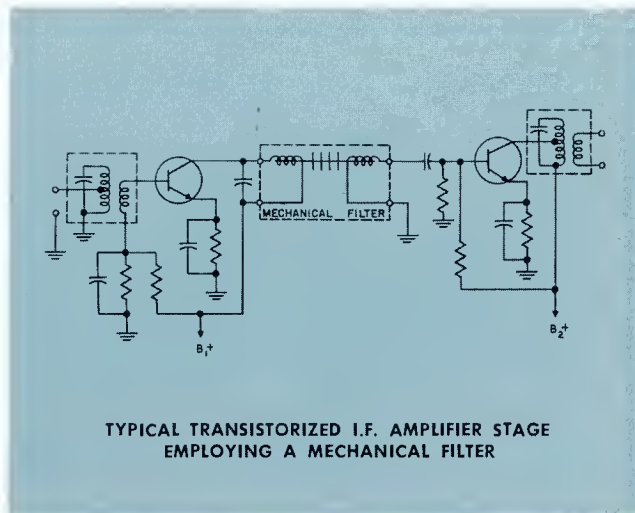
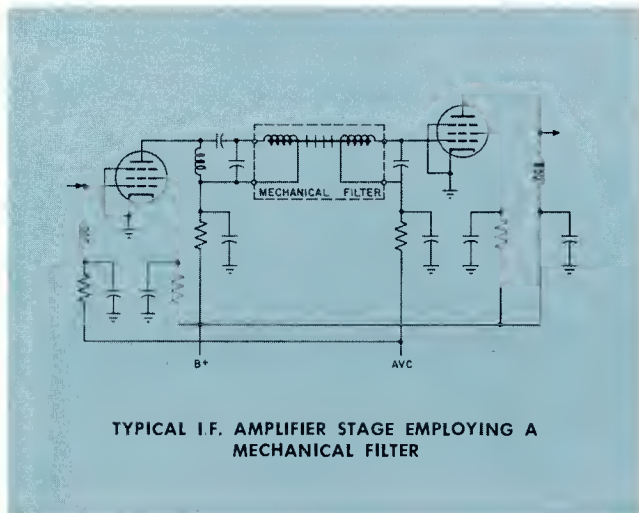
In some applications, such as balanced modulators, it is



HF AIRBORNE SINGLE SIDEBAND RECEIVER-EXCITER



HF GROUND SINGLE SIDEBAND TRANSCEIVER



desirable to terminate the Filter into a balanced load. For this reason, each set of terminals on the Filter is balanced to ground, eliminating the need for isolation transformers or amplifiers in circuits of this type.

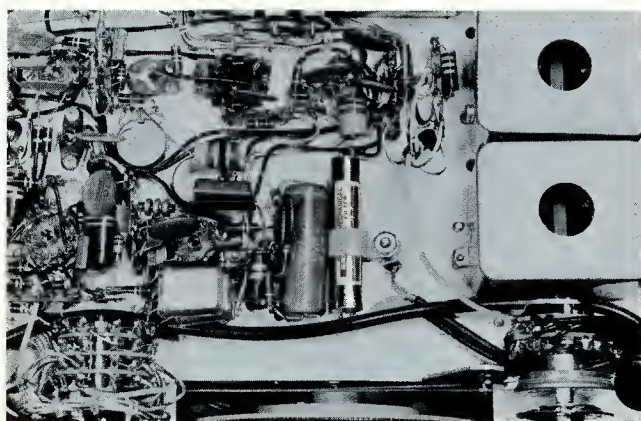
When Mechanical Filters are used in bandpass circuits there are a number of precautions that must be taken if full advantage is to be derived from its steep skirt rejection capabilities: the use of short wires between the Filter terminals and the termination circuitry; effective shielding between the input and the output, and the use of a common ground for the Filter input, shield and output. These precautions prevent the input signal from partially bypassing the Filter through inductive or capacitive coupling or ground loops.

In addition to the standard line of production Filters

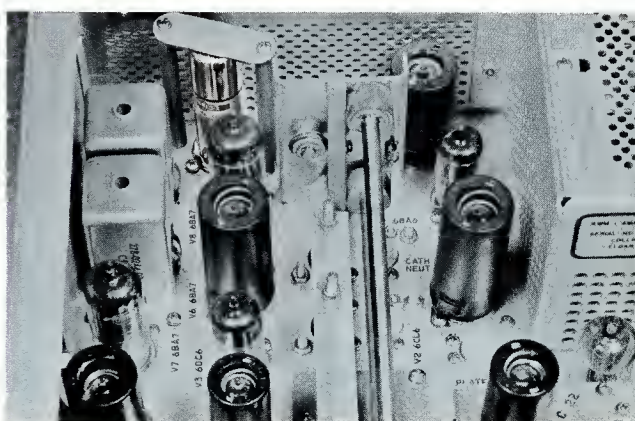
described in this catalog, Collins has designed many custom types for specific applications requiring characteristics different from standard filters. In some cases, electrical performance is more than adequate, but special packaging is required and can be accomplished.

Comb Filters are among the custom designs done in the past, and can be designed for operation anywhere in the 60 to 600 kc frequency range, with a wide range of bandwidths.

Collins also offers high "Q", low frequency Mechanical Resonators. Available are a series of Resonators in the audio frequency range from approximately 600 to 3000 cps and another series from approximately 20 to 25 kc. In both ranges, Resonator designs are spaced approximately 100 cycles apart. These Resonators all exhibit a "Q" of approximately 1000.



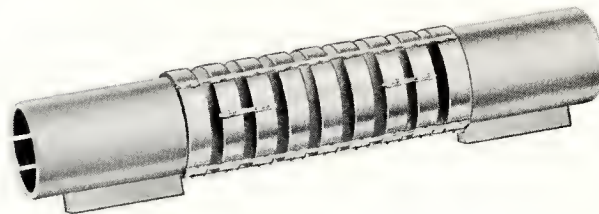
AMATEUR SINGLE SIDEBAND TRANSMITTER



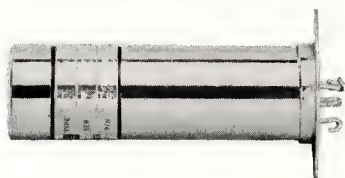
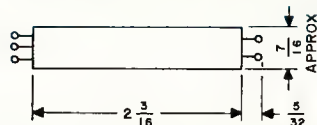
MOBILE AMATEUR SINGLE SIDEBAND TRANSCEIVER

CASE TYPES

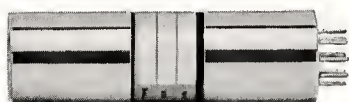
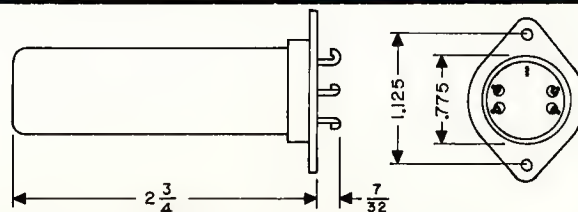
Mechanical Filters are available in a wide variety of case and mounting styles. The basic designs are shown on these pages; however, we will be pleased to discuss any special case configuration requirements you may have.



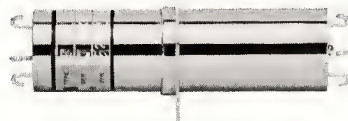
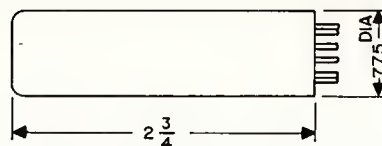
TYPE **Y**



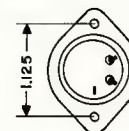
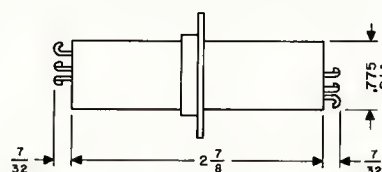
TYPE **H**



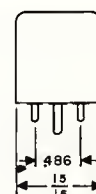
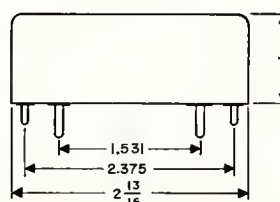
TYPE **J**



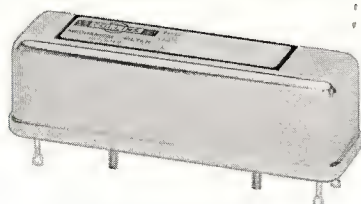
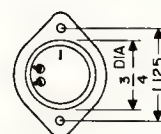
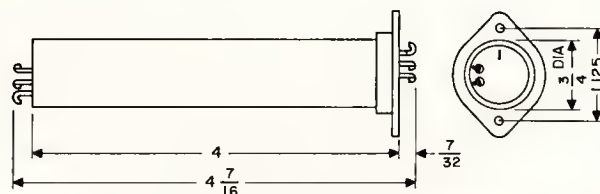
TYPE **K**



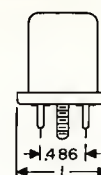
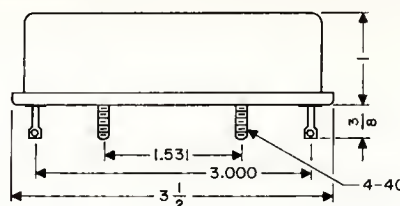
TYPE **E**

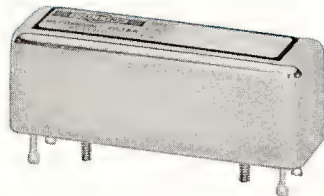


TYPE **W**

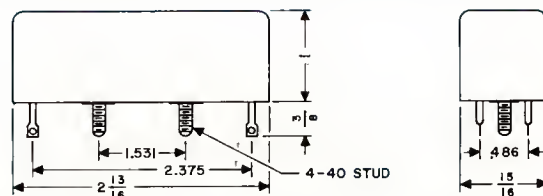


TYPE **C**

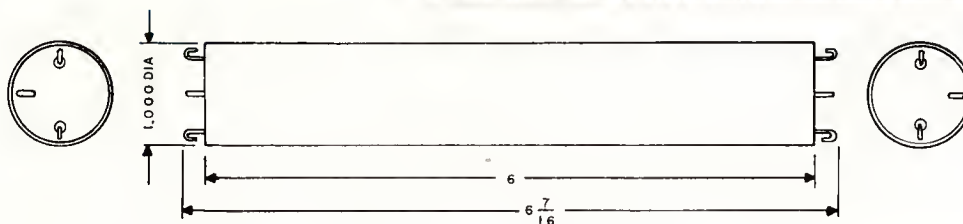




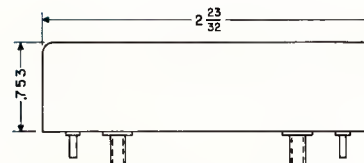
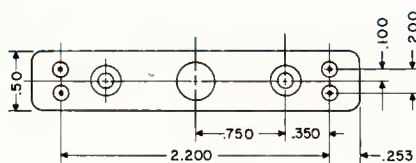
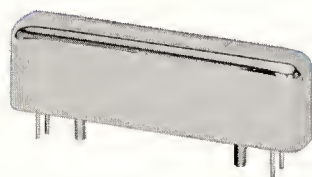
TYPE **F**



TYPE **L**



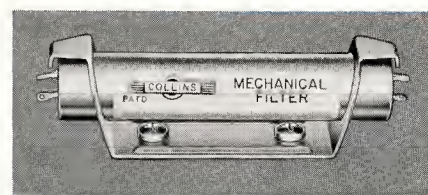
SHOWN BELOW IS AN EXAMPLE OF A SPECIAL CASE
DESIGNED TO A USER'S PACKAGING REQUIREMENTS



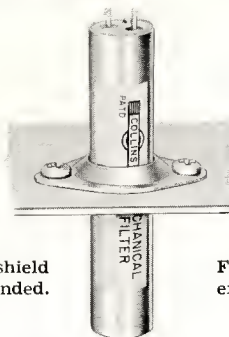
STANDARD Y SERIES MOUNTING BRACKETS



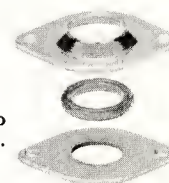
For mounting on flat surface
such as printed circuit board.



For mounting through chassis or shield
partition. This method recommended.



For adapting standard bracket to
existing tube socket hole pattern.



General Specifications

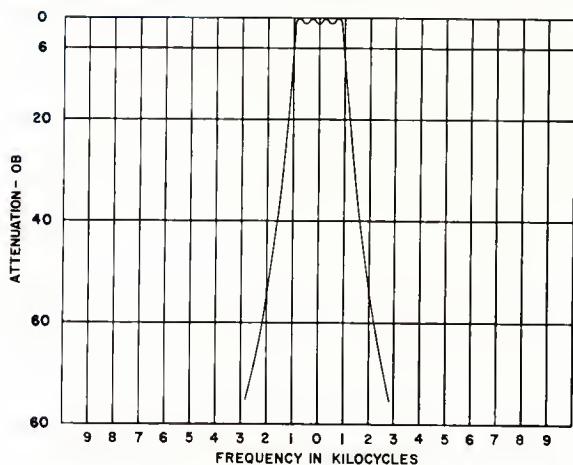
Shown on the following pages are typical selectivity characteristics of a number of standard production Filters. In general, the specifications for all Filters are written to call out limits for all of the parameters, and the actual characteristics exceed these limits by a comfortable margin. The curves indicate the actual performance to be expected from an average Filter.

The Filters are designed to meet the environmental requirements of MIL-STD specs, contained in small, hermetically sealed brass cases finished with Type VI, Class 2 nickel plate in accordance with Federal Specification QQ-N-290. The Filters thus withstand humidity tests, corrosion resistance tests and operation at extreme altitudes. Interior construction is such that the Filters withstand vibration in accordance with MIL-STD-202A, Method 201A, and shock in accordance with MIL-STD-202A, Method 202A. Filters will meet general performance requirements over the temperature range of -40°C to $+85^{\circ}\text{C}$ with the following maximum allowable deviation limits from the specified $+25^{\circ}\text{C}$ requirements:

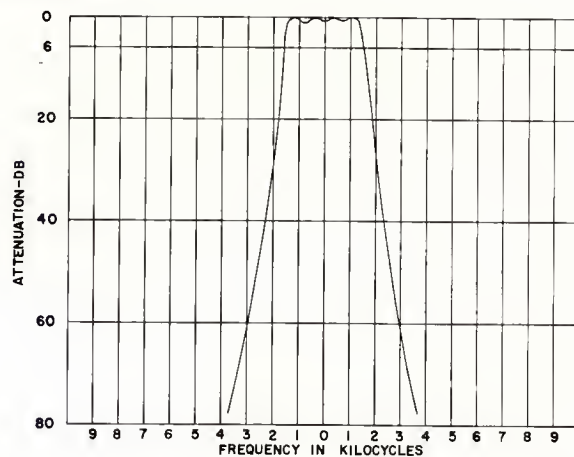
Center Frequency	10 PPM/ $^{\circ}\text{C}$
Bandwidth	$\pm 5\%$
Peak-to-Valley Ratio	1 db increase
Transfer Impedance	$\pm 10\%$

Filters can be stored at temperatures from -65°C to $+100^{\circ}\text{C}$ without detrimental effects.

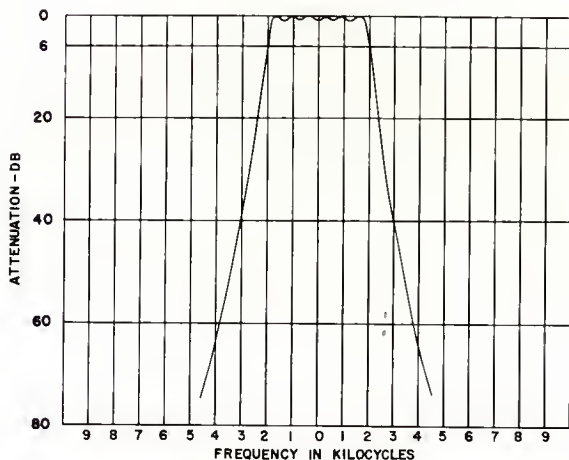
F455 MECHANICAL FILTER SERIES



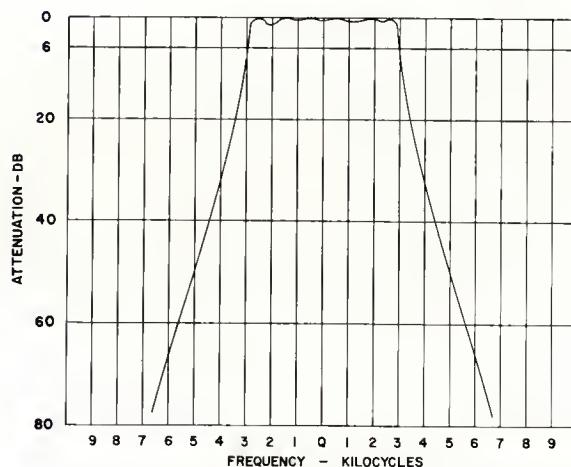
F455(*)-21 Center frequency 455 kc; 6 db bandwidth 2.1 kc;
60 db bandwidth 5.3 kc maximum.
*Case styles Y, E, F, H, J, K



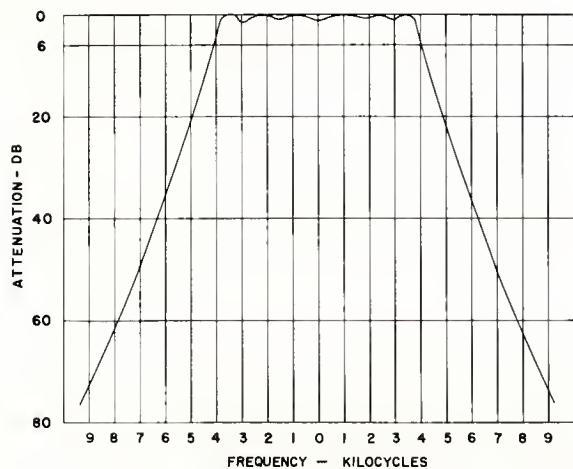
F455(*)-31 Center frequency 455 kc; 6 db bandwidth 3.1 kc;
60 db bandwidth 6.5 kc maximum.
*Case styles Y, E, F, H, J, K



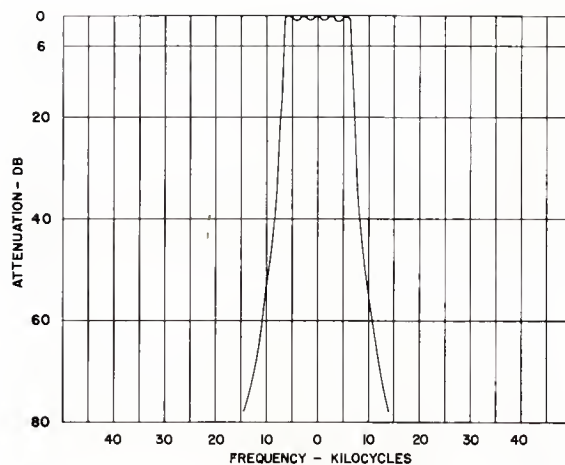
F455(*)-40 Center frequency 455 kc; 6 db bandwidth 4.0 kc;
60 db bandwidth 8.5 kc maximum.
*Case styles Y, E, F, H, J, K



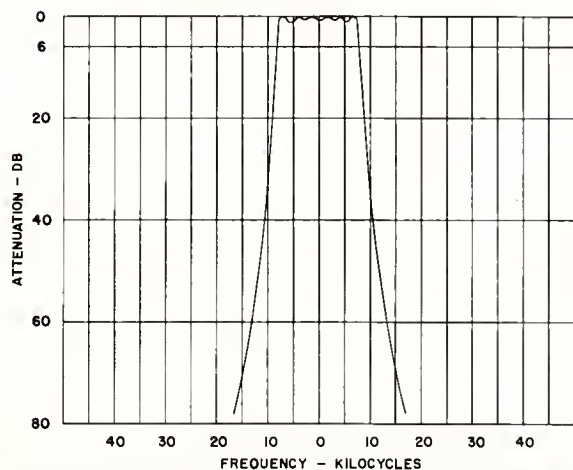
F455(*)-60 Center frequency 455 kc; 6 db bandwidth 6.0 kc;
60 db bandwidth 12.6 kc maximum.
*Case styles Y, E, F, H, J, K



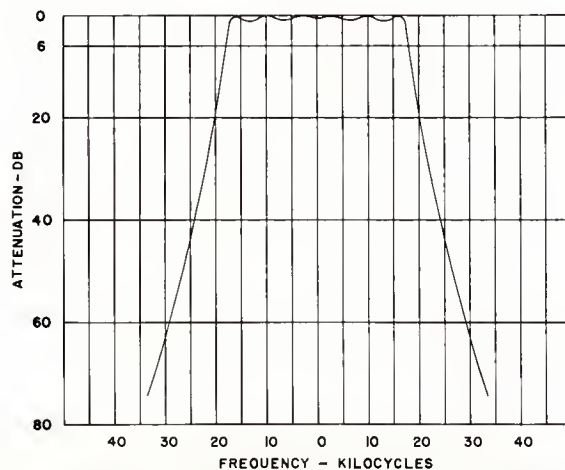
F455(*)-80 Center frequency 455 kc; 6 db bandwidth 8.0 kc;
60 db bandwidth 18.5 kc maximum.
*Case styles Y, E, F, H, J, K



F455(*)-120 Center frequency 455 kc; 6 db bandwidth 12.0 kc;
60 db bandwidth 23.0 kc maximum.
*Case styles Y, E, F, H, J, K

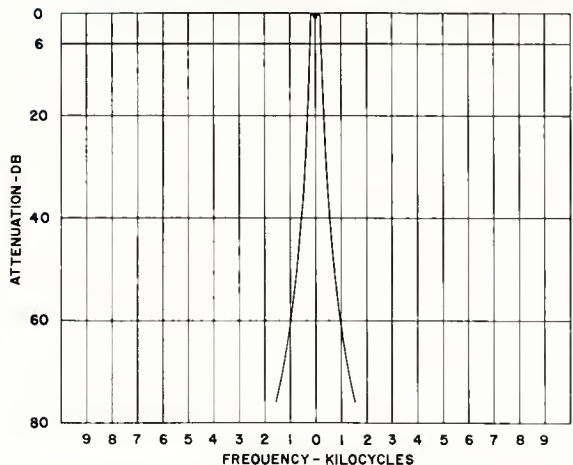


F455(*)-160 Center frequency 455 kc; 6 db bandwidth 16.0 kc;
60 db bandwidth 27.5 kc maximum.
*Case styles Y, E, F, H, J, K

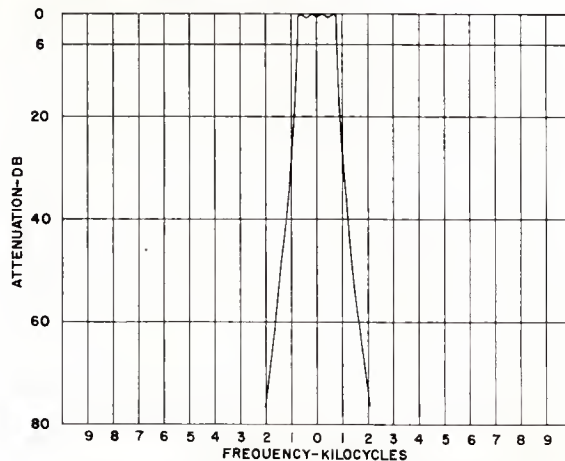


F455(*)-350 Center frequency 455 kc; 6 db bandwidth 35.0 kc;
6 db bandwidth 62.0 kc maximum.
*Case styles Y, E, F, H, J, K

F455 'NARROW' MECHANICAL FILTER SERIES

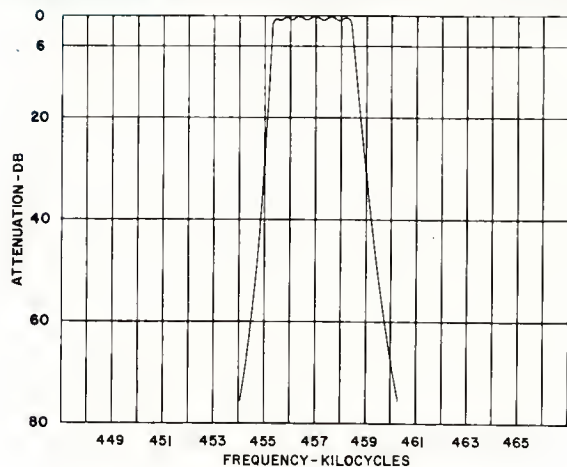


F455(*)-05 Center frequency 455 kc; 6 db bandwidth 0.5 kc;
60 db bandwidth 2.5 kc maximum.
*Case styles E, F, H, J, K

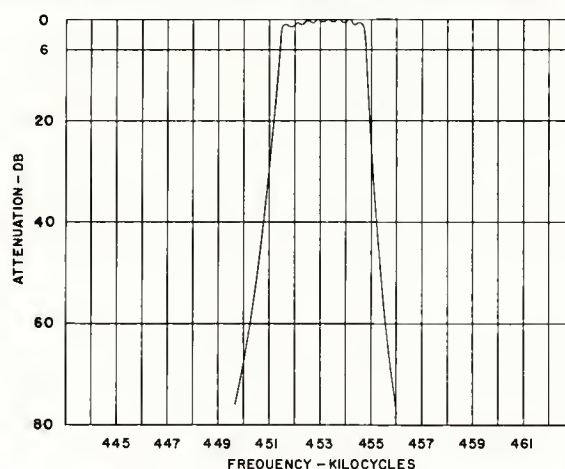


F455(*)-15 Center frequency 455 kc; 6 db bandwidth 1.5 kc;
60 db bandwidth 3.5 kc maximum.
*Case styles E, F, H, J, K

SSB MECHANICAL FILTER SERIES FOR 455 KC CARRIER

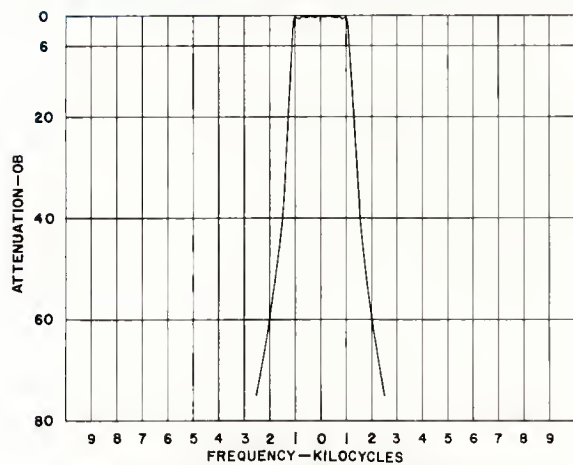


F455Z-4 (Upper sideband)
Case style Y (7/16" dia. x 2 1/2" long)

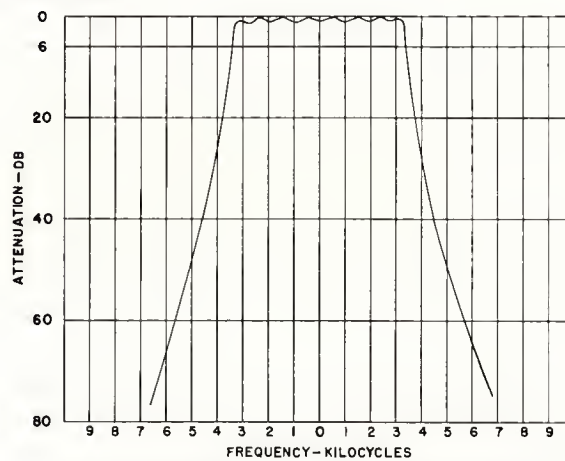


F455Z-5 (Lower sideband)
Case style Y (7/16" dia. x 2 1/2" long)

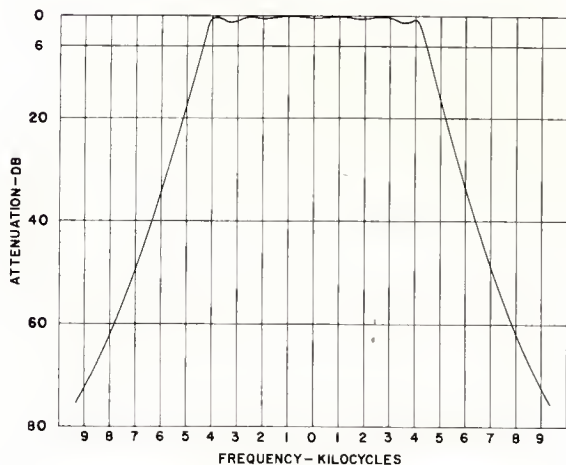
F250 MECHANICAL FILTER SERIES



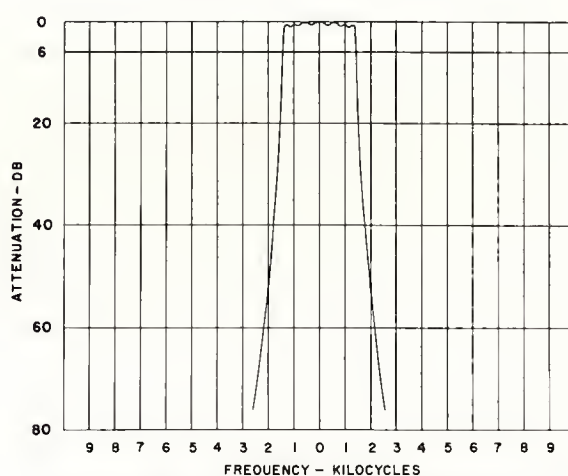
F250A-20 Center frequency 250 kc; 6 db bandwidth 2.0 kc;
60 db bandwidth 4.3 kc maximum.
Case style C



F250A-67 Center frequency 250 kc; 6 db bandwidth 6.7 kc;
60 db bandwidth 14.0 kc maximum.
Case style C

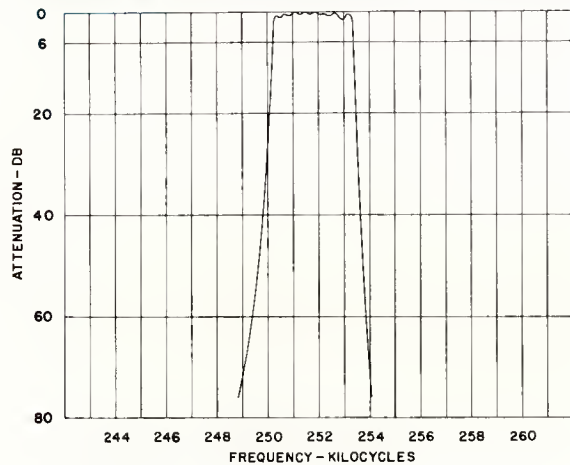


F250A-85 Center frequency 250 kc; 6 db bandwidth 8.5 kc;
60 db bandwidth 18.0 kc maximum.
Case style C

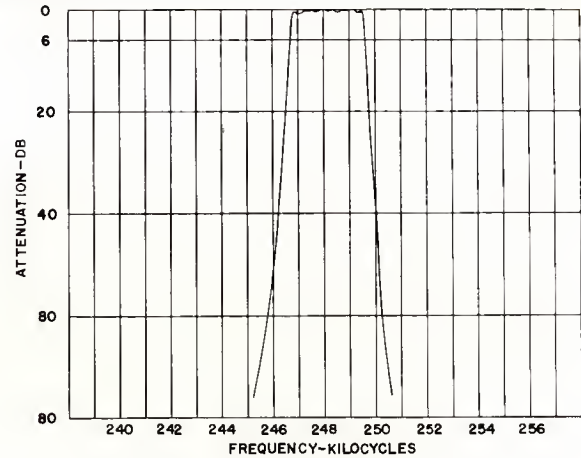


F250Z-3 Center frequency 250 kc; 6 db bandwidth 3.0 kc;
40 db bandwidth 4.5 kc maximum.
Case style W

SSB MECHANICAL FILTER SERIES FOR 250 KC CARRIER

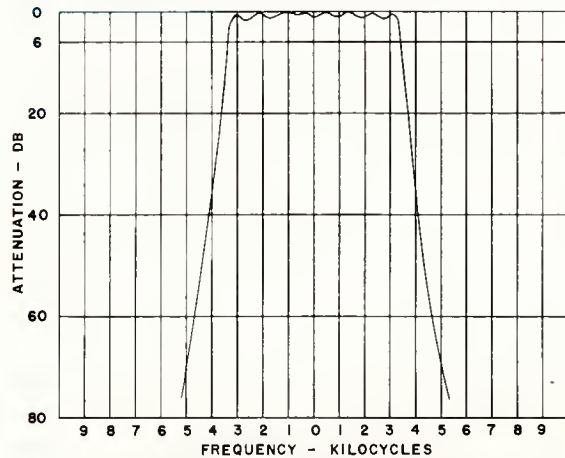


F250Z-4 (Upper sideband) Case style C

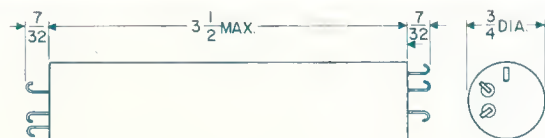
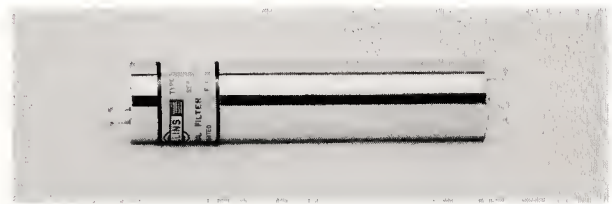


F250Z-5 (Lower sideband) Case style C

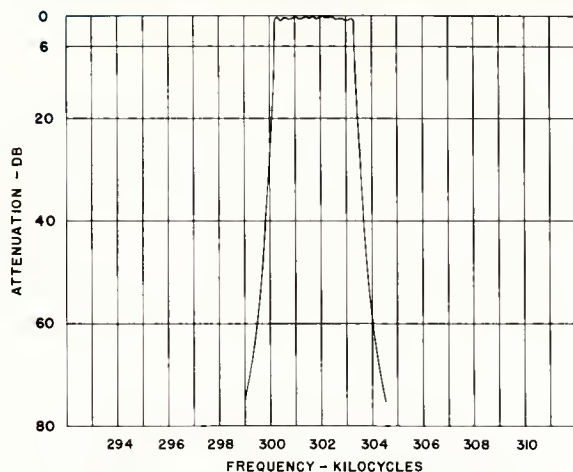
F300 MECHANICAL FILTER SERIES



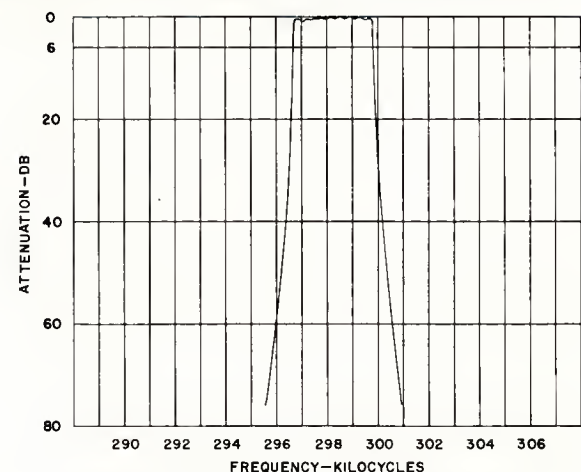
F300X-68 Center frequency 300 kc; 6 db bandwidth 6.8 kc;
60 db bandwidth 13.2 kc maximum.
Case style at right



SSB MECHANICAL FILTER SERIES FOR 300 KC CARRIER

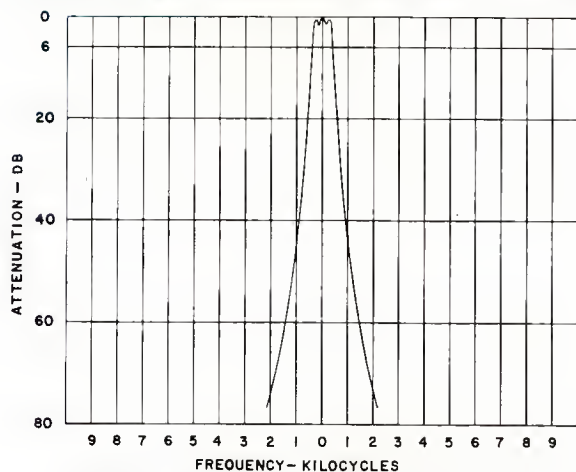


F300Z-4 (Upper sideband) Case style same as above

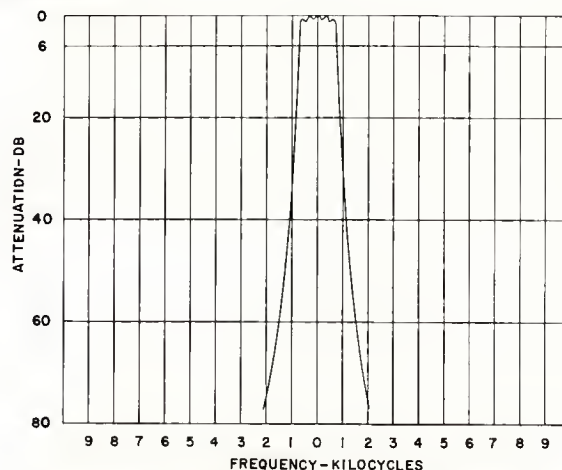


F300Z-5 (Lower sideband) Case style same as above

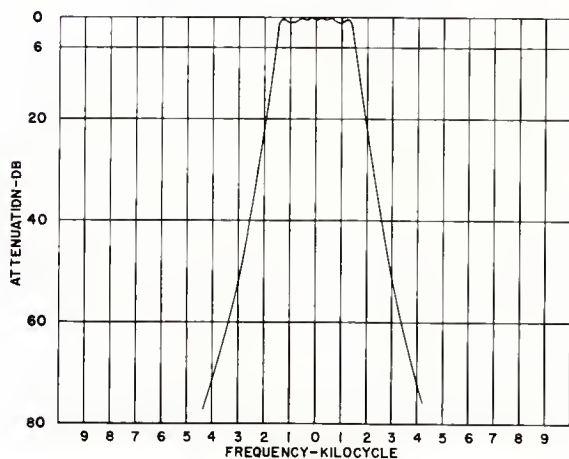
F500 MECHANICAL FILTER SERIES



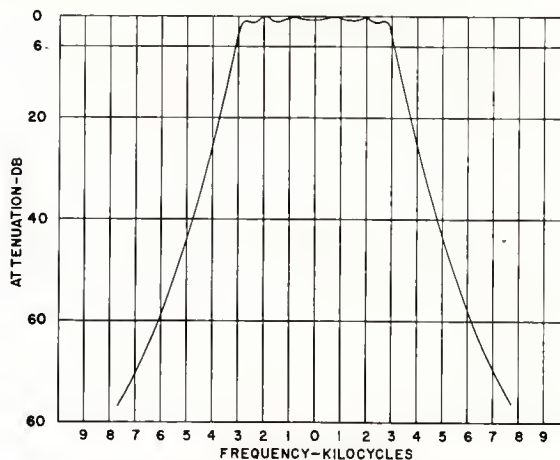
F500(*)-08 Center frequency 500 kc; 6 db bandwidth 800 cps;
60 db bandwidth 3.5 kc maximum.
*Case styles E, F



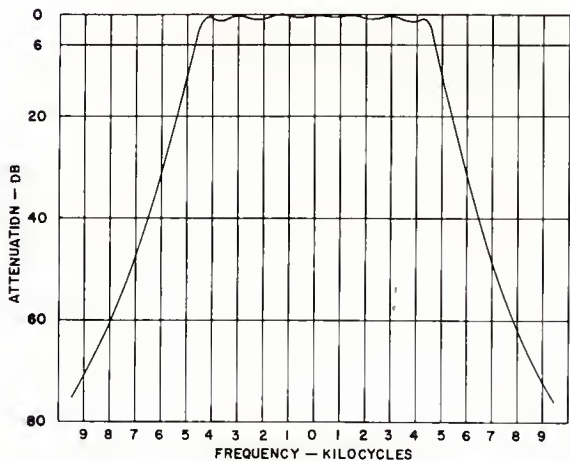
F500(*)-14 Center frequency 500 kc; 6 db bandwidth 1.4 kc;
60 db bandwidth 3.5 kc maximum.
*Case styles E, F



F500(*)-31 Center frequency 500 kc; 6 db bandwidth 3.1 kc;
60 db bandwidth 7.5 kc maximum.
*Case styles E, F



F500(*)-60 Center frequency 500 kc; 6 db bandwidth 6.0 kc;
60 db bandwidth 14.0 kc maximum.
*Case styles E, F



F500(*)-94 Center frequency 500 kc; 6 db bandwidth 9.4 kc;
60 db bandwidth 19.0 kc maximum.
*Case styles E, F

CUSTOM DESIGN

This catalog is devoted mainly to information of standard production Filters. However, it is possible to obtain special types with a wide variety of characteristics. We are interested in discussing your requirements and can furnish price and delivery information upon request. Address your inquiries to:

Product Line Manager, Components
Collins Radio Company
Western Division
2700 West Olive Avenue
Burbank, California

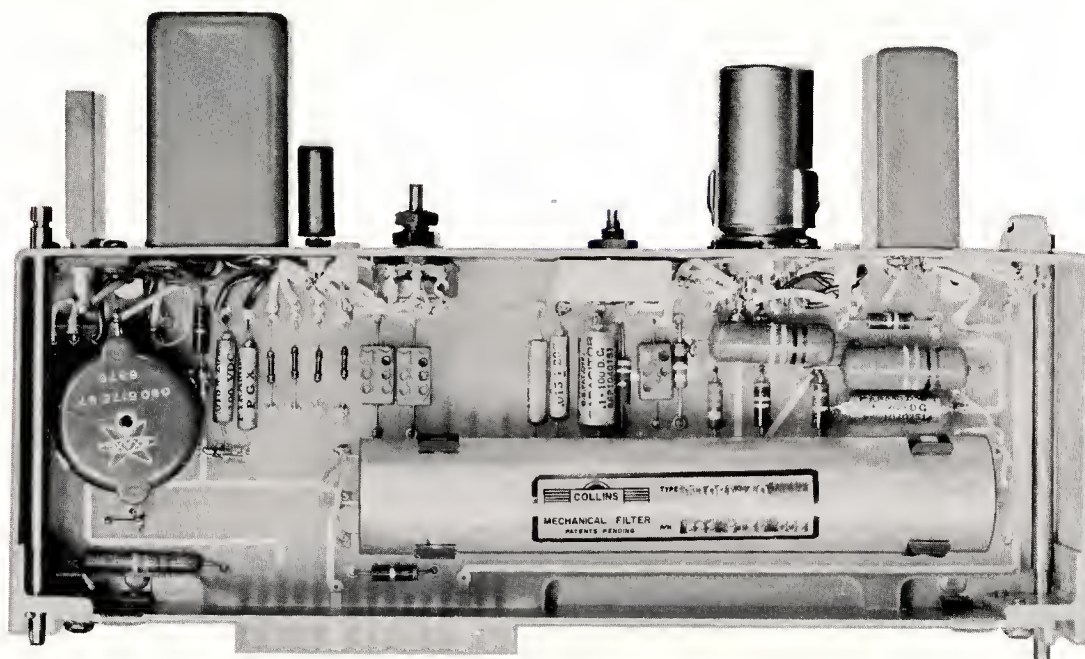
Voice Multiplex Mechanical Filter Series

Collins has in standard production a series of voice channel selector Filters for use in multiplex systems. These Filters are designed for 4 kc channel spacing and operate as upper sideband selectors. There are 12 Filters, side-by-side, starting from a low carrier frequency of 60 kc and going to a high carrier frequency of 104 kc.

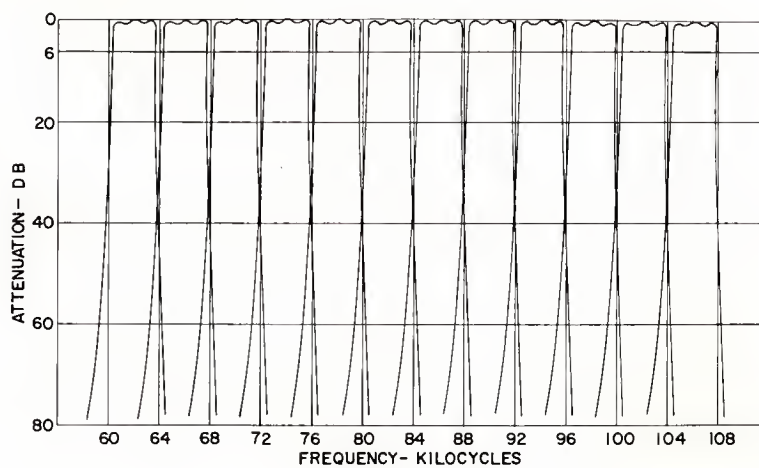
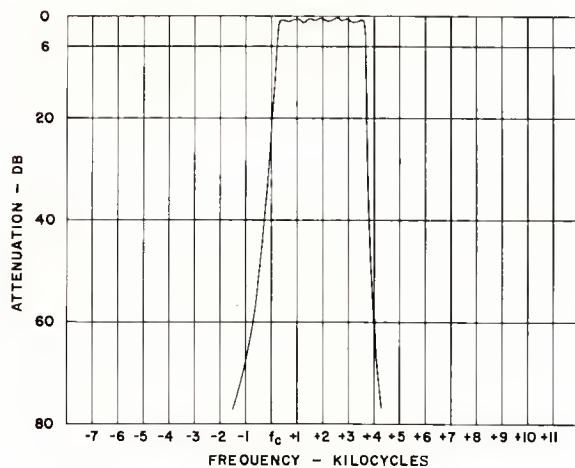
A generalized curve is shown detailing typical selectivity of one of the Filters in this series. The frequency scale shows

carrier frequency as f_c . As stated previously, f_c can be 60 kc, 64 kc and any 4 kc increment up to 104 kc. The other plot shows more clearly the relationship of each of the Filters to the others in the series.

A series of Filters such as this can be designed for operation anywhere in the 60 to 600 kc range, for upper or lower sideband selection.



VOICE MULTIPLEX MODULE UTILIZING MECHANICAL FILTER

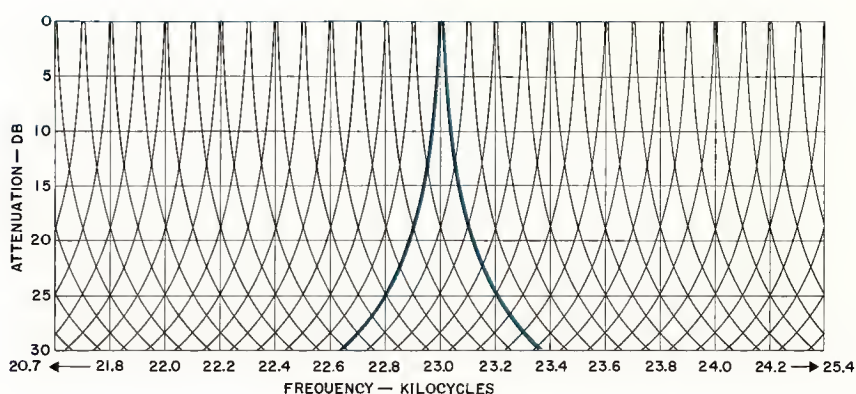


Low Frequency Mechanical Resonators

Two basic groups of Resonators have been designed and are in standard production. One group at audio frequencies starts at 605 cps and includes every 110 cycle interval up to 2695 cps. Special designs are also available in this frequency range up to 2915 cps. The second group consists of Resonators spaced at every 100 cycle interval from 20.7 to 25.4 kc.

These devices all employ single resonant elements, so the selectivity characteristic follows a universal resonance curve for a single element with a "Q" of approximately 1000. The figure at right graphically illustrates their relationship to each other.

More detailed technical information and pricing is available on request.

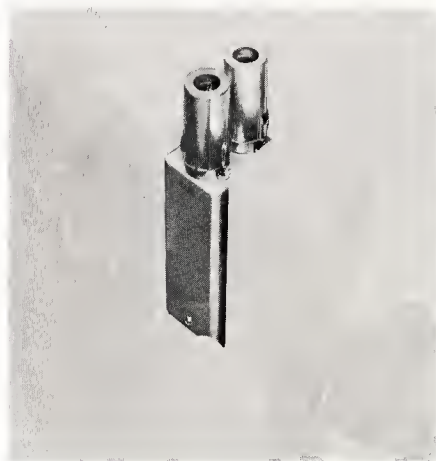


Mechanical Filter Adapters

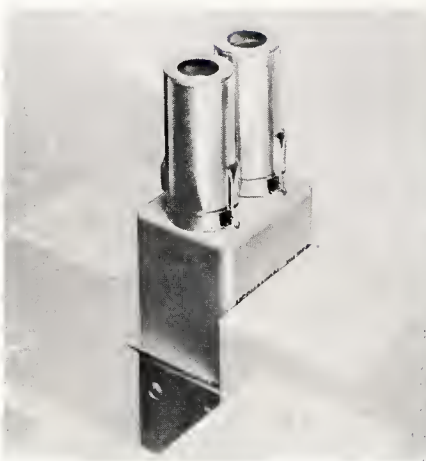
Collins Mechanical Filter Adapter is for plug-in use in several Hammarlund and National receivers as well as Collins amateur and communication receivers. It is a self-contained plug-in unit about the size of an IF transformer. It contains a Mechanical Filter, two IF amplifier tubes with necessary circuits, and a tube-type connector for plugging the unit into

either the first or second IF tube socket. Power and signal circuits for the Adapter are supplied through the original socket connections.

Collins representatives will be pleased to discuss your requirements for any special Adapter Kits if you will write or call the address on the back cover.



353A For Hammarlund SP400, National HRO-60.



353B For Hammarlund SP-600-JX.



353D For National HRO-50, HRO-50T1.

MECHANICAL FILTER ADAPTER TYPE

353A, B, D-05
353A, B, D-15
353A, B, D-31
353A, B, D-60

FILTER TYPE USED

F455F-05
F455F-15
F455F-31
F455F-60

BANDWIDTH AT -6 db

0.5 kc
1.5 kc
3.1 kc
6.0 kc

Mechanical Filter Summary Table

The table below lists the standard Mechanical Filters available. Detailed specifications will be forwarded on request.

Center Freq.	Type No.	Part No.	6 db Bandwidth	Max. 60 db Bandwidth	Case Style
250 kc	F250A-20	526-9012-00	2.0 kc	4.3 kc	C
250 kc	F250Z-3	526-9080-00	2.7 kc	5.5 kc	W
250 kc	F250A-67	526-9039-00	6.7 kc	14.0 kc	C
250 kc	F250A-85	526-9049-00	8.5 kc	18.0 kc	C
300 kc	F300X-68	526-9307-00	6.8 kc	13.2 kc	($\frac{3}{4}$ " dia. x $3\frac{1}{2}$ " long)
455 kc	F455E-05	526-9321-00	0.5 kc	2.5 kc	E
455 kc	F455F-05	526-9318-00	0.5 kc	2.5 kc	F
455 kc	F455H-05	526-9229-00	0.5 kc	2.5 kc	H
455 kc	F455J-05	526-9154-00	0.5 kc	2.5 kc	J
455 kc	F455K-05	526-9228-00	0.5 kc	2.5 kc	K
455 kc	F455E-15	526-9370-00	1.5 kc	3.5 kc	E
455 kc	F455F-15	526-9227-00	1.5 kc	3.5 kc	F
455 kc	F455H-15	526-9170-00	1.5 kc	3.5 kc	H
455 kc	F455J-15	526-9155-00	1.5 kc	3.5 kc	J
455 kc	F455K-15	526-9168-00	1.5 kc	3.5 kc	K
455 kc	F455E-21	526-9322-00	2.1 kc	5.3 kc	E
455 kc	F455F-21	526-9323-00	2.1 kc	5.3 kc	F
455 kc	F455H-21	526-9313-00	2.1 kc	5.3 kc	H
455 kc	F455J-21	526-9156-00	2.1 kc	5.3 kc	J
455 kc	F455K-21	526-9317-00	2.1 kc	5.3 kc	K
455 kc	F455Y-21	526-9337-00	2.1 kc	5.3 kc	Y
455 kc	F455E-31	526-9074-00	3.1 kc	6.5 kc	E
455 kc	F455F-31	526-9075-00	3.1 kc	6.5 kc	F
455 kc	F455H-31	526-9093-00	3.1 kc	6.5 kc	H
455 kc	F455J-31	526-9089-00	3.1 kc	6.5 kc	J
455 kc	F455K-31	526-9169-00	3.1 kc	6.5 kc	K
455 kc	F455Y-31	526-9338-00	3.1 kc	6.5 kc	Y
455 kc	F455E-40	526-9324-00	4.0 kc	8.5 kc	E
455 kc	F455F-40	526-9325-00	4.0 kc	8.5 kc	F
455 kc	F455H-40	526-9326-00	4.0 kc	8.5 kc	H
455 kc	F455J-40	526-9327-00	4.0 kc	8.5 kc	J
455 kc	F455K-40	526-9303-00	4.0 kc	8.5 kc	K
455 kc	F455Y-40	526-9339-00	4.0 kc	8.5 kc	Y
455 kc	F455E-60	526-9084-00	6.0 kc	12.6 kc	E
455 kc	F455F-60	526-9087-00	6.0 kc	12.6 kc	F
455 kc	F455H-60	526-9094-00	6.0 kc	12.6 kc	H
455 kc	F455J-60	526-9091-00	6.0 kc	12.6 kc	J
455 kc	F455K-60	526-9159-00	6.0 kc	12.6 kc	K
455 kc	F455Y-60	526-9340-00	6.0 kc	12.6 kc	Y
455 kc	F455E-80	526-9332-00	8.0 kc	18.5 kc	E
455 kc	F455F-80	526-9331-00	8.0 kc	18.5 kc	F
455 kc	F455H-80	526-9330-00	8.0 kc	18.5 kc	H
455 kc	F455J-80	526-9329-00	8.0 kc	18.5 kc	J
455 kc	F455K-80	526-9328-00	8.0 kc	18.5 kc	K
455 kc	F455Y-80	526-9341-00	8.0 kc	18.5 kc	Y
455 kc	F455E-120	526-9336-00	12.0 kc	23.0 kc	E
455 kc	F455F-120	526-9173-00	12.0 kc	23.0 kc	F
455 kc	F455H-120	526-9171-00	12.0 kc	23.0 kc	H
455 kc	F455J-120	526-9333-00	12.0 kc	23.0 kc	J
455 kc	F455K-120	526-9316-00	12.0 kc	23.0 kc	K
455 kc	F455Y-120	526-9342-00	12.0 kc	23.0 kc	Y
455 kc	F455E-160	526-9320-00	16.0 kc	27.5 kc	E
455 kc	F455F-160	526-9335-00	16.0 kc	27.5 kc	F
455 kc	F455H-160	526-9314-00	16.0 kc	27.5 kc	H
455 kc	F455J-160	526-9334-00	16.0 kc	27.5 kc	J
455 kc	F455K-160	526-9315-00	16.0 kc	27.5 kc	K
455 kc	F455Y-160	526-9343-00	16.0 kc	27.5 kc	Y
455 kc	F455E-350	526-9371-00	35.0 kc	62.0 kc	E
455 kc	F455F-350	526-9180-00	35.0 kc	62.0 kc	F
455 kc	F455H-350	526-9302-00	35.0 kc	62.0 kc	H
455 kc	F455J-350	526-9300-00	35.0 kc	62.0 kc	J
455 kc	F455K-350	526-9186-00	35.0 kc	62.0 kc	K
455 kc	F455Y-350	526-9344-00	35.0 kc	62.0 kc	Y
500 kc	F500B-08	526-9007-00	0.8 kc	3.5 kc	E
500 kc	F500B-14	526-9030-00	1.4 kc	3.8 kc	E
500 kc	F500F-14	526-9215-00	1.4 kc	3.5 kc	F
500 kc	F500B-31	526-9008-00	3.1 kc	7.5 kc	E
500 kc	F500B-60	526-9009-00	6.0 kc	14.0 kc	E
500 kc	F500F-60	526-9319-00	6.0 kc	19.0 kc	F
500 kc	F500F-94	526-9216-00	9.4 kc	19.0 kc	F

MECHANICAL FILTERS FOR SINGLE SIDEBAND

60 kc	F60Z-4	526-9190-00	Upper Sideband	L
64 kc	F64Z-4	526-9191-00	" "	L
68 kc	F68Z-4	526-9192-00	" "	L
72 kc	F72Z-4	526-9193-00	" "	L
76 kc	F76Z-4	526-9194-00	" "	L
80 kc	F80Z-4	526-9195-00	" "	L
84 kc	F84Z-4	526-9196-00	" "	L
88 kc	F88Z-4	526-9197-00	" "	L
92 kc	F92Z-4	526-9198-00	" "	L
96 kc	F96Z-4	526-9199-00	" "	L
100 kc	F100Z-4	526-9139-00	" "	L
104 kc	F104Z-4	526-9140-00	" "	L
250 kc	F250Z-4	526-9130-00	" "	C
250 kc	F250Z-5	526-9131-00	" "	C
300 kc	F300Z-4	526-9312-00	Lower Sideband	($\frac{3}{4}$ " dia. x $3\frac{1}{2}$ " long)
300 kc	F300Z-5	526-9311-00	Upper Sideband	($\frac{3}{4}$ " dia. x $3\frac{1}{2}$ " long)
455 kc	F455Z-1	526-9095-00	Lower Sideband	H
455 kc	F455Z-2	526-9096-00	Upper Sideband	H
455 kc	F455Z-4	526-9364-00	Lower Sideband	Y (7/16" dia. x $2\frac{1}{2}$ " long)
455 kc	F455Z-5	526-9365-00	Upper Sideband	Y (7/16" dia. x $2\frac{1}{2}$ " long)



CUSTOM DESIGN— *If the Filters in this catalog do not fill your requirements address inquiries to*

Product Line Manager, Components
Collins Radio Company
Western Division
2700 West Olive Avenue
Burbank, California